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AN INTERGLACIAL FAUNA FOUND IN CAYUGA VALLEY AND ITS RELATION TO THE PLEISTOCENE OF TORONTO

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On the western shore of Cayuga Lake, in central New York, is an interglacial fossiliferous deposit which is of interest because of the rarity of similar beds which contain traces of Pleistocene life.

The deposit is between Taughannock Falls and Frontenac Beach in a small ravine which has cut through one of the delta terraces so common in Cayuga valley. It was first noticed some time since by Professor R. S. Tarr and was later examined by Professor G. D. Harris and the writer. The following is a vertical section of the locality.

Drift	20 to 30 feet
Gravel and sand	several inches
Fossiliferous clay	5 to 8 feet
Bowlder clay	10 to 15 feet
Devonian shales	10 feet exposed above lake level

The bowlder clay in its uppermost part passes into gravel and sand which are decidedly oxidized, indicating a period of erosion and weathering.

The clay in which the fossils are imbedded is a slaty blue color, loose and very peaty at the base where it is composed almost wholly of the remains of plants, but in the center it becomes compact and is a very fine-grained, blue clay. It is distinctly stratified and splits easily along the plane of bedding but not in any other direction.

Above the fossiliferous blue clay are a few inches of sand and gravel pointing to a short period of erosion at the close of the warm interglacial period before the return of the ice and the deposition of the great mass of overlying drift.

The fossils are all fresh-water shells. Unios, Anodontas, and Sphaeriums are common and of large size, showing that conditions were favorable for their growth, but few are well preserved.

The following species have been identified and are in the geological museum of Cornell University.

Anodonta fragilis Lam. (*marginata* Say)
Anodonta grandis Say
Anodonta grandis var. *footiana* Lea
Lampsilis luteolus Lam.
Lampsilis ventricosus Barnes
Sphaerium simile Say
Pisidium compressum Prime
Pisidium virginicum Bourg.
Limnaea palustris Mull.
Limnaea elodes Say
Physa heterostropha Say
Planorbis bicarinatus Say
Planorbis deflectus Say
Planorbis lentus? Say
Planorbis parvus Say
Amnicola limosa Say
Valvata tricarinata Say
Campeloma decisa Say

Of these species *Sphaerium simile*, *Pisidium compressum*, *Planorbis deflectus*, *Amnicola limosa*, and *Valvata tricarinata* are the commonest forms.

Every one of the species listed has been found, by the writer, now living in Cayuga Lake. But of the five Unionidae, four are Mississippi species which are, however, also living now in the St. Lawrence system. *Anodonta fragilis* is the only one that strictly belongs to the St. Lawrence. *Luteolus* though originally a Mississippi species has secured such a foothold in the St. Lawrence system as to have become one of the commonest shells of the Finger Lakes.

On comparing the Cayuga Valley Pleistocene shells with those of the well-known interglacial beds near Toronto, about 170 miles to the northwest of Ithaca, we find the following species common to both deposits.

Lampsilis luteolus Lam.
Anodonta grandis Say
Sphaerium simile Say
Pisidium compressum Prime
Limnaea elodes Say
Planorbis parvus Say
Planorbis bicarinatus Say
Amnicola limosa Say
Physa heterostropha Say
Valvata tricarinata Say
Campeloma desisa Say

Thus more than half the interglacial species found in Cayuga Valley have also been identified in the warm climate or Don valley beds of the Toronto formation.[1]

But while we find that every one of the interglacial species of Cayuga Valley are now re-established in Cayuga Lake, on the contrary, two-thirds of the Unios in the Don valley beds withdrew permanently from Lake Ontario after the destruction of their colonies. These forms required a milder climate and could only live in Ontario during the warm interglacial period when, as Coleman has shown, the climate of Toronto was so mild as to permit the growth of the paw-paw and the osage orange.

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[1] See A. P. Coleman, *Amer. Geol.*, Vol. XIII (1894), pp. 85–95; *Journ. Geol.*, Vol. IX (1901), pp. 285–310; also C. T. Simpson, *Proc. U. S. Nat. Mus.*, Vol. XVI, pp. 591–95.

In addition to the similarity of faunas of the Don and Cayuga valley deposits, there is a great similarity of levels. According to Mr. Coleman the lowest of the Don valley beds was formed when the water stood 19 feet above the present level of Lake Ontario. The Cayuga valley deposit began to be formed with the water about twenty feet above the present lake level.

It is unfortunate that the plant remains in the Cayuga valley interglacial bed are too decayed and fragmentary for identification, but the lowest layers of the fossiliferous blue clay, like the lowest of the Don valley beds, are formed of sheets of vegetable matter consisting of twigs, fragments of leaves, and reeds.

In conclusion we may say that (1) the Cayuga interglacial colony was established by Mississippi and St. Lawrence molluscs which came down from the north and west; (2) this would have required a very considerable period of time after their widespread destruction in the preceding ice invasions; (3) the colony could not have been established during a slight oscillation northward of the ice (as might have been the case if the species had come in from the Susquehanna system); (4) more than one-half the molluscs found in the Cayuga valley deposit are reported from the Don valley beds of the Toronto formation; (5) the Cayuga and Don valley fossiliferous beds both began to be formed when the water stood about twenty feet above the present lake levels; (6) it is very probable that the Cayuga fossiliferous deposit corresponds approximately in time with the Don valley, or warm climate beds, of the Toronto Pleistocene formation which is regarded as representing the Peorian, or fourth, interglacial period.